Case Studies on Transport Policy xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Case Studies on Transport Policy

journal homepage: www.elsevier.com/locate/cstp

Evaluating state level transportation revenue alternatives

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ARTICLE INFO

Keywords:
Transportation funding policy
Revenue generation
Multi-criteria analysis
Evaluation
Decision making
Scenario analysis

ABSTRACT

Numerous studies have investigated the state of transportation funding in US states and forecasted a significant funding deficiency. Reasons for this include the lack of political will to increase the rates of fuel taxes, the loss in purchasing power of the fuel tax due to inflation, and the reduction in revenue due to increased use of alternative fuel vehicles. Possible options to generate the additional revenue to fill this funding gap range from modifying existing taxes and fees to implementing new revenue sources. However, determining what to do and offering policy recommendations can be challenging and may vary from jurisdiction to jurisdiction. The authors' critical review of the methods used by earlier studies that evaluate revenue generation strategies at the state level reveals a lack of systematic analysis. In response, the authors propose the use of a systematic multi-criteria analysis (MCA) as a better decision support tool. The MCA is argued to be an improvement over current methods because the best funding strategy depends not only on revenue generation but also on other parameters such as fairness and ease of implementation. To support the argument, the authors conduct a comprehensive multi-criteria evaluation of transportation revenue generation alternatives for the State of Texas. The authors' criteria system provides a better platform for including the priorities of stakeholders and policy makers at different levels. Including an outranking method such as PROMETHEE and a scenario analysis, the evaluation becomes more objective and more transparent. This enables the decision makers to more effectively compare the competing objectives of different alternatives. The authors discuss the drawbacks of the recent transportation funding decisions made by the Texas Legislature and highlight how the systematic evaluation can improve decision making. The authors recommend that states follow the systematic evaluation of funding options described in this paper, which can provide policy makers and the public a better understanding of the pros and cons of the funding options thereby helping them to select the most suitable funding strategy.

1. Introduction

In 2014, governments at all levels in the United States spent about $230 billion to build, operate and maintain highway and transit systems. Similar to many recent years, most of this money came from state and local governments; about one quarter came from the federal government, mainly from the Highway Trust Fund (HTF) (Congressional Budget Office, 2015). About 90% of revenue for the HTF comes from federal fuel taxes while the remaining comes from taxes on truck and tire sales, and heavy vehicle use (Congressional Budget Office, 2015). At the state and local levels, revenue for funding highways and transit is generated through various methods such as taxes on motor fuels and lubricants, vehicle registration or license fees, vehicle weight fees, tolls, public transit fares, property taxes, and sales and use taxes. For example, the major transportation revenue sources in Texas are a per-gallon tax on gasoline and diesel, an annual vehicle registration fee, a sales tax on motor fuel lubricants, additional county level registration fees and county level sales and use tax for transit purpose. Other minor revenue sources such as vehicle certificate fees, highway beautification fees and fines from traffic violators also exist (Legislative Budget Board Staff, 2013).

In a normal situation, the revenue accumulated for transportation funding should be adequate to fulfill the capital and maintenance expenditures required to satisfy any increases in travel demand. However, in the last two decades, a number of studies have investigated the current state of transportation funding in different states throughout the United States (US) and determined that a significant gap between future funding needs and expected revenues exists. For example, at the national level, see the studies by the Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance (2006) and the

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http://dx.doi.org/10.1016/j.cstp.2017.06.002
Received 11 August 2016; Received in revised form 1 June 2017; Accepted 9 June 2017

National Surface Transportation Policy and Revenue Study Commission (2007), and, at state level, see the studies by the Mineta Transportation Institute (Weinstein et al., 2006), and the Arkansas Blue Ribbon Committee on Highway Finance (2015). This deficiency starts at the federal level. The revenue credited to the HTF has become lower than the outlays from it; since 2008, transfers of fixed amounts from the US Treasury's general fund into the HTF have kept it from negative balances (Congressional Budget Office, 2015). While the studies have recommended increasing revenue by raising the fuel tax rate to compete with the escalating transportation funding need and decreasing purchasing power of the HTF revenue due to inflation, the Congress has not made such a decision.

While the implementation of a sustainable long-term solution for the deficiency in the HTF is delayed, state level revenue sources have also been undergoing similar problems as the public support for increasing taxes has been low. Moreover, with the latest fuel efficiency norms in the US (Office of the Press Secretary, 2012), the use of carbon fuels is expected to decrease, which in turn reduces the revenue from fuel tax. States and local governments often address funding constraints by focusing on infrastructure project prioritization, thereby only spending resources on critical projects. They try to increase revenue generation at state or local level, implement project financing methods such as tolling, public-private-partnerships or selling public bonds. For example, Texas has used bonds, tolling and public-private-partnerships to finance many highway projects in the last decade (Legislative Budget Board Staff, 2013). Meanwhile, the assumption that direct user charges in the form of tolling and vehicle miles traveled (VMT) fees encourage efficient use of highway facilities appears to be increasing the momentum for these type of charges to increase revenue.

With multiple strategies available to decrease the gap between the funding need and the expected revenue, the transportation authorities and policy makers of states have conducted studies to compare (or evaluate) the alternatives and identify the best strategy or strategies for the future. In this paper, the authors focus on evaluating the revenue generation alternatives for filling the gap between the future transportation funding need and expected revenue.

The comparison of revenue generation alternatives requires consideration of their ability to generate revenue to satisfy the funding need. However, other criteria may also require consideration before selecting the best alternative. For example, the ease of an alternative's implementation and its fairness or "equity" may affect an alternative's attractiveness. Fairness or "equity" has multiple dimensions. One of them is based on use – if all road users are charged a fee in proportion to their use, such a fee is fair in terms of use. More explanation on equity concepts may be found in Section 4.2. The extent to which an alternative satisfies a criterion is called its performance on the criteria. The NCHRP Report 377 describes a set of criteria and a framework for evaluating alternative revenue sources in transportation. These criteria are grouped into four categories: adequacy in satisfying need, equity, efficiency and simplicity (Reno and Stowers, 1995).

Cost benefit analysis (CBA) and multi-criteria analysis (MCA) represent two commonly used methods for evaluating transportation projects or policies. In CBA, the analyst quantifies all costs of the project/policy, and benefits and dis-benefits resulting from the project/policy to the public and transforms them into monetary terms. Then, the analyst uses benefit-cost ratio to inform the decision maker about the economic viability of the project/proposal. However, in problems such as evaluating revenue generation alternatives, assessing the performance on all the criteria in monetary terms is not possible. The alternatives' performance may be represented on different scales for different criteria, and the scale may be quantitative or qualitative. In order to address such problems, a MCA proves useful (Dodgson et al., 2000). The evaluation framework in MCA allows all criteria to be comprehensively integrated using a rational and consistent strategy that captures differences in importance and scales between the criteria (Dodgson et al., 2000; Rogers, 2001).

In the last ten to fifteen years, many US states have sponsored studies to evaluate a pool of options to generate revenue and recommend a way forward to reduce or eliminate the gap between the state's future transportation funding need and the expected available funds. The majority of these studies are performed by a committee formed by the Legislature or the sponsor of the study. The authors critically review these evaluations with regard to the recommended solutions and the methods or justifications behind them. They find many shortcomings in the methods used by these studies because the studies fail to implement a formal multi-criteria methodology for evaluation. Many studies rely on the study committee's internal discussion, or on a compilation of stakeholder or public opinion to recommend future actions. Although a few studies decompose the problem into criteria, the aggregation/synthesis approaches tend to be non-existent or ad hoc.

In response, the authors develop a comprehensive multi-criteria evaluation methodology for evaluating alternative state level transportation revenue generation methods. The authors enhance the decision support by developing a scenario analysis that determines the effect on the final recommendations by considering changes in the original assumptions. The analyst is able to perform these sensitivity tests because the evaluation is divided into components systematically. The scenario analysis also allows decision makers to define and test any new alternatives. The authors demonstrate their methodology by evaluating the alternative revenue generation methods for the State of Texas. Texas is selected for the case study because the authors are able to gain access to key decision makers, and it is similar to many US states with regards to the revenue generation alternatives considered and how the transportation decisions are made. For this evaluation, the authors develop the criteria system based on the priorities of officials who are involved in Texas transportation funding policy decision making. The authors' earlier paper discusses the Delphi survey organized by them for obtaining the officials' opinions and the resultant criteria system (Pulipati and Mattingly, 2013) . The authors use the criteria system from the above paper in the evaluation demonstrated in this paper. Based on this evaluation, they recommend future funding strategies and compare them with the decisions made in the recent legislative sessions. By discussing the deficiencies in the decisions made by the legislature, the authors stress the need for a systematic evaluation process.

The next section describes the MCA method and its applications in transportation decision making, and places this case study in the context. The review of recent evaluations in various states is presented in the third section. The fourth section presents the evaluation of revenue generation alternatives for Texas including the scenario analysis. The decisions made by the Texas state legislature in the last two sessions and how they relate to the authors' recommendations are presented in the fifth section. The paper concludes by discussing how the MCA can help decreasing the current deficiencies in deciding the future funding strategy.

2. Multi-criteria analysis – its applications in transportation decisions

In a simple form, a MCA consists of a discussion of each alternative's performance on the criteria. A formal MCA includes the steps outlined in Fig. 1 (Rogers, 2001). The evaluation requires a set of criteria based on the project or policy's objective(s) (Dodgson et al., 2000). MCA methods show the contribution of each alternative on different criteria explicitly. All alternatives are first evaluated on one criterion at a time, where each alternative is assigned a quantitative/qualitative performance score, forming a "performance matrix" where each row corresponds to one alternative and each column contains performance scores of all alternatives on one criterion. In a basic form of MCA, the decision maker is left with the task of assessing the extent to which the alternatives meet the objectives by observing the entries in the performance matrix. In more analytically sophisticated strategies, a mathematical method is used to combine these separate criteria to recommend a decision. The mathematical method may result in one best alternative, a shortlist of preferred alternatives, a rank